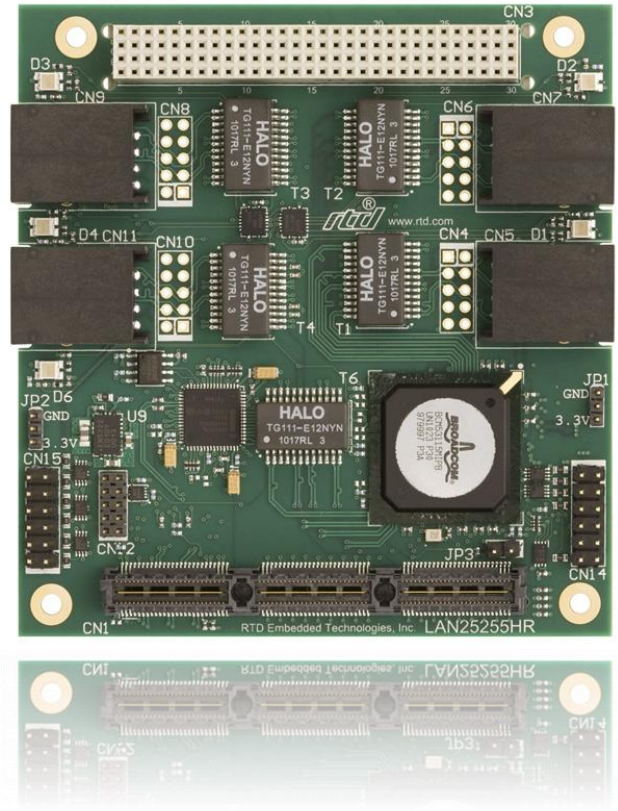
LAN25255HR & LAN35255HR
IDAN-LAN25255HR, IDAN-LAN35255HR, IDAN-LAN25256HR, IDAN-LAN35256HR, IDAN-LAN25256HR-SFP, & IDAN-LAN35256HR-SFP

Gigabit Ethernet Unmanaged Switch

User's Manual

BDM-610020088 Rev. D



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Revision History

Rev A	Initial Release	10/30/2012
Rev B	Added IDAN-LAN25256HR and IDAN-LAN35256HR versions	12/9/2013
Rev C	Updated power specifications and added jumbo frames	8/20/2014
Rev D	Added a DIL pin assignment figure, updated figure numbers	3/5/2015

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1 Introduction

1.1 Product Overview

The LAN25255HR/LAN35255HR is designed to provide four Gigabit Ethernet ports for expanding the networking capabilities of any system. The board can be used either in a PCI/104-Express system or as a standalone module. In a stack it uses an x1 PCI Express link for an onboard Gigabit Ethernet controller. As a standalone module it provides four RJ45 ports one as an upstream port and 3 downstream ports. This board is compatible with all PCI Express cpuModules. The LAN25255HR has both a PCIe/104 and PCI-104 connectors. The LAN35255HR has only the PCIe/104 connector. The boards are available in IDAN frames with either 9-pin "D" connectors or RJ45 connectors.

1.2 Board Features

- BroadCom BCM53115 Gigabit Ethernet Switch:
  - 5 Full Duplex Unmanaged Gigabit Ethernet Ports
    - 1 port connects to the onboard WG82574IT Gigabit Ethernet controller
    - 4 Ports Ethernet switch, any port can be the uplink
  - Any port can be the uplink, remaining links will be downlinks.
  - Ports have automatic MDI crossover to eliminate the need for crossover cables
  - Supports Jumbo frames up to 9720 bytes
  - Industrial Temperature rated: -40 to +85 C
- PCI Express (PCIe) x1 Interface to CPU through PCIe/104 bus
  - Universal interface operates on Type 1 and Type 2 PCIe/104 buses
- PCI Express Bus:
  - Provides 2.5 Gbps in each direction
  - Single lane and single Virtual Channel operation
    - Compatible with multi-Virtual Channel chipsets
  - Packetized serial traffic with PCI Express Split Completion protocol
  - Data Link Layer Cyclic Redundancy Check (CRC) generator and checker
  - Automatic Retry of bad packets
  - In-band interrupts and messages
  - Message Signaled Interrupt (MSI) support
- PCI Bus is used as a pass through interface on LAN25255HR, not present on the LAN35255HR

1.3 Ordering Information

The LAN25255HR/LAN35255HR is available with the following options:

Table 1: Ordering Options

Part Number	Description
LAN25255HR	4 port Gigabit Ethernet Switch PCI/104-Express
IDAN-LAN25255HR	4 port Gigabit Ethernet Switch PCI/104-Express in IDAN enclosure with 9-pin "D" connectors
IDAN-LAN25256HR	4 port Gigabit Ethernet Switch PCI/104-Express in IDAN enclosure with RJ45 connectors
LAN35255HR	4 port Gigabit Ethernet Switch PCIe/104
IDAN-LAN35255HR	4 port Gigabit Ethernet Switch PCIe/104 in IDAN enclosure with 9-pin "D" connectors
IDAN-LAN35256HR	4 port Gigabit Ethernet Switch PCIe/104 in IDAN enclosure with RJ45 connectors
IDAN-LAN35256HR-SFP	5 port Gigabit Ethernet Switch PCIe/104 in IDAN enclosure with RJ45 connectors and SFP socket

Figure 1: LAN25255

The Intelligent Data Acquisition Node (IDAN™) building block can be used in just about any combination with other IDAN building blocks to create a simple but rugged 104™ stack. This module can also be incorporated in a custom-built RTD HiDAN™ or HiDANplus High Reliability Intelligent Data Acquisition Node. Contact RTD sales for more information on our high reliability systems.

1.4 Contact Information

1.4.1 Sales Support

For sales inquiries, you can contact RTD Embedded Technologies sales via the following methods:

Phone: 1-814-234-8087 Monday through Friday, 8:00am to 5:00pm (EST).
E-Mail: sales@rtd.com

1.4.2 Technical Support

If you are having problems with you system, please try the steps in the Troubleshooting section of this manual.

For help with this product, or any other product made by RTD, you can contact RTD Embedded Technologies technical support via the following methods:

Phone: 1-814-234-8087 Monday through Friday, 8:00am to 5:00pm (EST).
E-Mail: techsupport@rtd.com

2 Specifications

2.1 Operating Conditions

Table 2: Operating Conditions

Symbol	Parameter	Test Condition	Min	Max	Unit
V_{cc5}	5V Supply Voltage		4.75	5.25	V
V_{cc3}	3.3V Supply Voltage		n/a	n/a	V
T_a	Operating Temperature		-40	+85	C
T_s	Storage Temperature		-55	+125	C
RH	Relative Humidity	Non-Condensing	0	90%	%
MTBF	Mean Time Before Failure	30C	TBD		Hours

2.2 Electrical Characteristics

Table 3: Electrical Characteristics

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
Power +5V	Power Consumption	1 port connected (MAC/Phy) 2 ports connected 3 ports connected 4 ports connected 5 ports connected 5 ports and RJ45 SFP connected		1.3 1.8 2.2 2.7 3.2 4.0		W
I_{BUS5}	5V Current between buses				8.0	A
	PCIe/104 Bus					
	Differential Output Voltage		0.8		1.2	V
	DC Differential TX Impedance		95.2		116.9	Ω
	Differential Input Voltage		0.175		3.3	V
	DC Differential RX Impedance		92.7		115.8	Ω
	Electrical Idle Detect Threshold		61		173	mV

3 Board Connection

3.1 Board Handling Precautions

To prevent damage due to Electrostatic Discharge (ESD), keep your board in its antistatic bag until you are ready to install it into your system. When removing it from the bag, hold the board at the edges, and do not touch the components or connectors. Handle the board in an antistatic environment, and use a grounded workbench for testing and handling of your hardware.

3.2 Physical Characteristics

- Weight: Approximately 55 g (0.12 lbs.)
- Dimensions: 90.17 mm L x 95.89 mm W (3.550 in L x 3.775 in W)

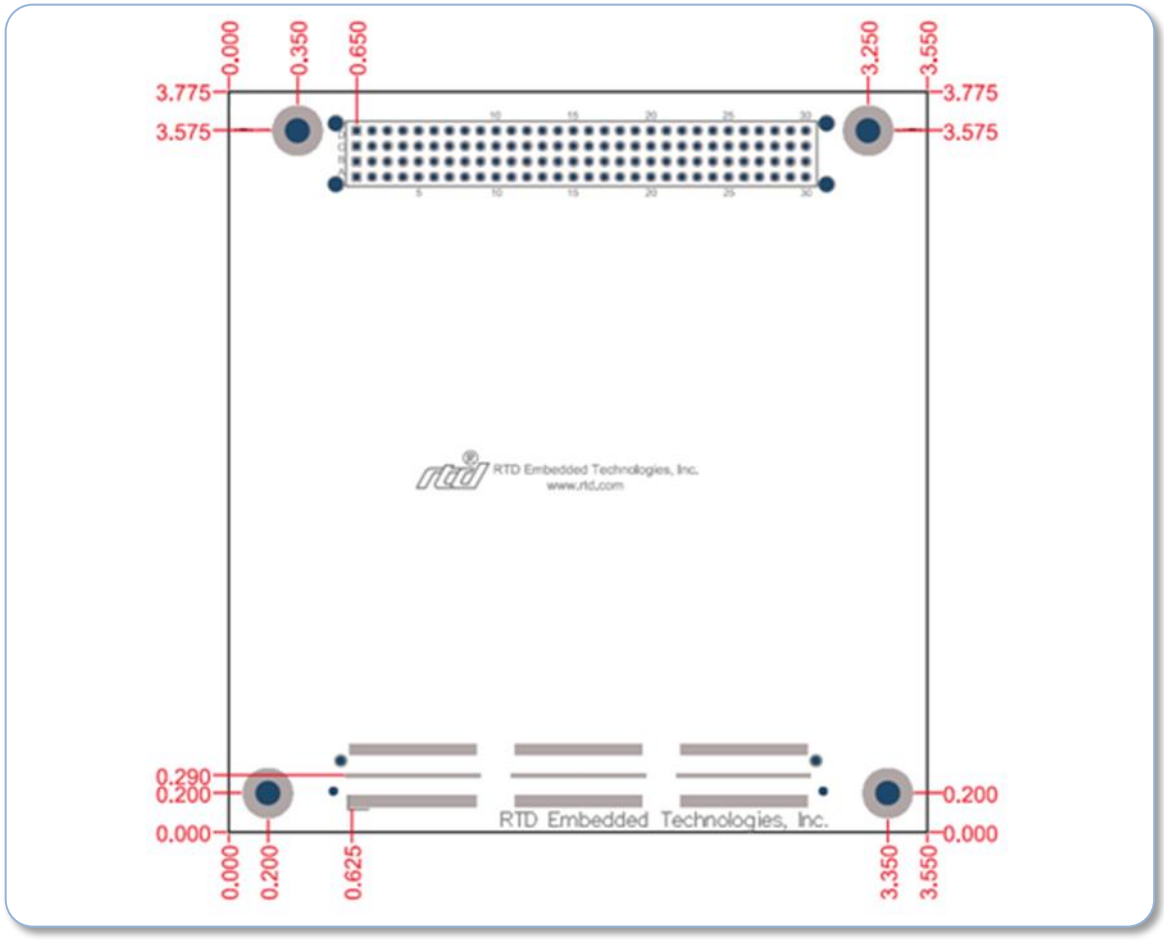


Figure 2: Board Dimensions

3.3 Connectors and Jumpers

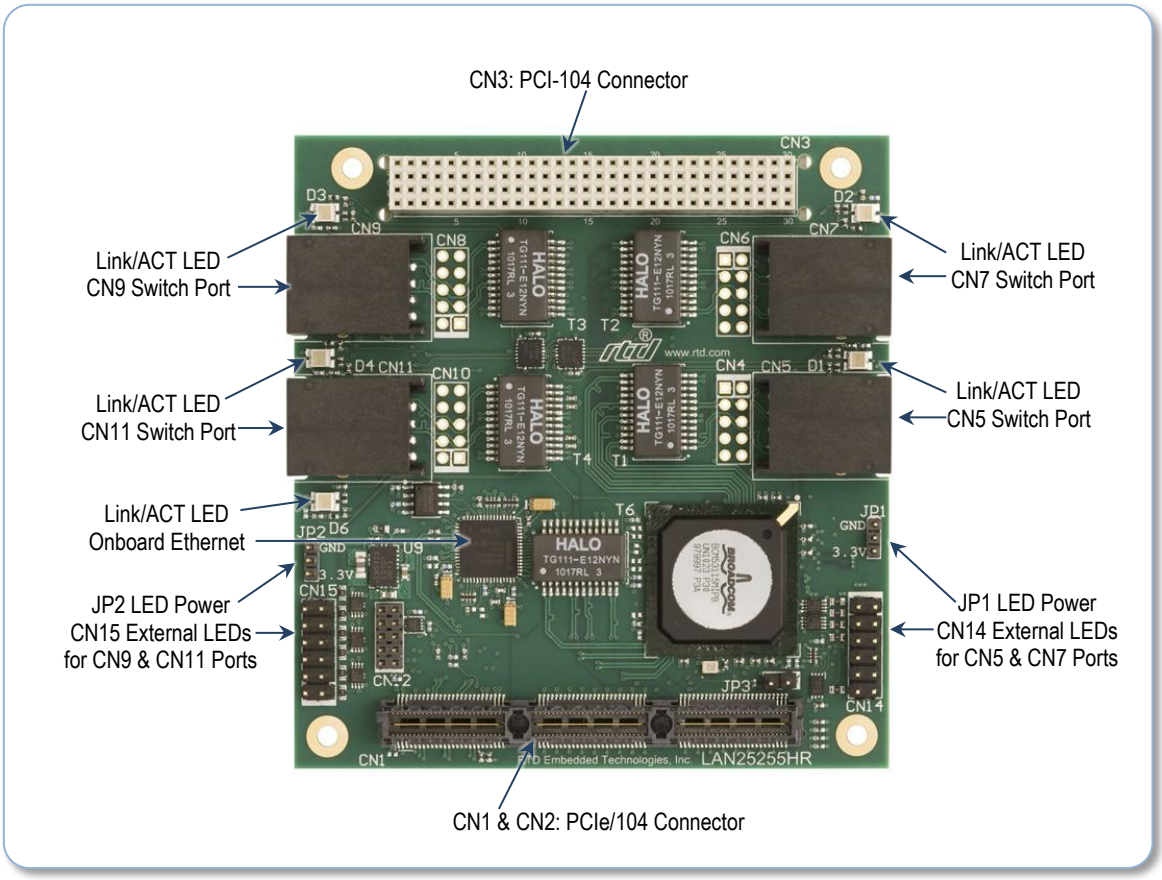


Figure 3: LAN25255HR/LAN35255HR Board Connections

3.3.1 External I/O Connectors and Jumpers

- CN5/7/9/11: RJ-45 connectors for Ethernet access
- CN4/6/8/10: 2x5 0.1" DIL connector not populated in standard product. Used for bringing out the Ethernet ports in an IDAN system.
- CN14/15: External LED connectors
- JP1 and JP2: Power for external LED connectors CN14 and CN15
- CN12 and JP3: Factory use only

3.3.2 RJ45 Twisted Pair Ethernet, CN5, CN7, CN9, CN11

Connectors CN5, CN7, CN9, and CN11 are for UTP (Unshielded Twisted Pair) wiring normally used for 10/100/1000 Base-T Ethernet. It is the default factory installed twisted pair connector on the board. The following table gives the pin out of CN5, CN7, CN9, and CN11.

Pin	1000 Function	10/100 Function
1	MDI_A+	Transmit +
2	MDI_A-	Transmit -
3	MDI_B+	Receive +
4	MDI_C+	Not Used
5	MDI_C-	Not Used
6	MDI_B-	Receive -
7	MDI_D+	Not Used
8	MDI_D-	Not Used

Table 4: RJ45 Signal Assignments

CN5, CN7, CN9, and CN11 are standard female RJ-45 connectors. The figure below shows the pin numbering when **looking into the connector**:

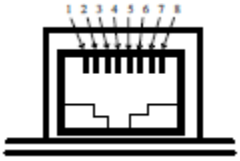


Figure 2: RJ-45 Jack Connector

3.3.3 TWISTED PAIR ETHERNET CN4, CN6, CN8, AND CN10

CN4, CN6, CN8, and CN10 are optional connectors which can be factory installed in place of the RJ45 connector. This connector is not installed when the RJ45 connector is installed. The pin out of CN4, CN6, CN8, and CN10 is in the table below.

Pin	1000 Function	10/100 Function	RJ-45 Pin
1	MDI_B+	Receive +	3
2	MDI_B-	Receive -	6
3	MDI_C+	Not Used	4
4	MDI_C-	Not Used	5
5	MDI_A+	Transmit +	1
6	MDI_A-	Transmit -	2
7	MDI_D+	Not Used	7
8	MDI_D-	Not Used	8
9	Shield Ground		
10	Shield Ground		

Table 5: DIL Signal Assignments

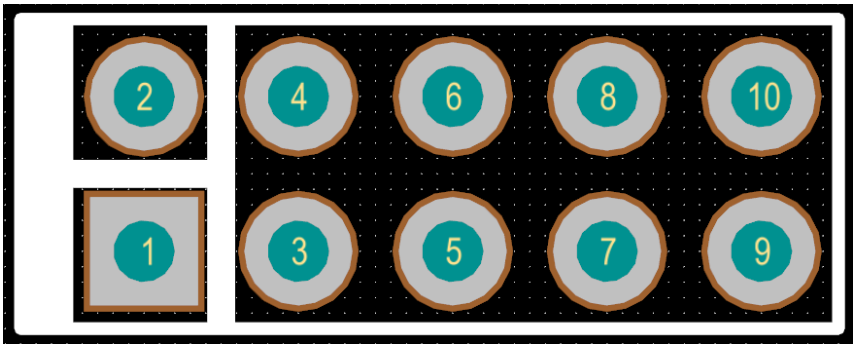


Figure 3: DIL Pin Number Assignment

3.3.4 STATUS LEDS

The tri-color LEDs on the board are used to indicate the status of the Ethernet ports.

LED Color	Description
Off	No Link
Green	Link at 1000 Mbps
Blue	Link at 100 Mbps
Red	Link at 10 Mbps
Blink	Activity

Table 6: Status LEDs

3.3.5 External Status LED Connectors CN14 and CN15

CN14 and CN15 are the status LED signals that are buffered and able to source or sink 24 mA. Additionally, JP1 and JP2 can select either 3.3 volts or ground to use with these signals. The pin out is in the tables below.

CN14 Pin	Function	10/100 Function
1	CN5 Link at 10 Mbps	Low when linked at 10 Mbps, blink for activity
3	CN5 Link at 100 Mbps	Low when linked at 100 Mbps, blink for activity
5	CN5 Link at 1000 Mbps	Low when linked at 1000 Mbps, blink for activity
7	CN7 Link at 10 Mbps	Low when linked at 10 Mbps, blink for activity
9	CN7 Link at 100 Mbps	Low when linked at 100 Mbps, blink for activity
11	CN7 Link at 1000 Mbps	Low when linked at 1000 Mbps, blink for activity
2, 4, 6, 8, 10, 12	3.3 volts or ground Depends on JP2 setting	If JP1 1-2 is shorted these pins will be ground If JP1 2-3 is shorted these pins will be 3.3 volts

Table 7: CN14 External LED Drive

CN15 Pin	Function	10/100 Function
1	CN9 Link at 10 Mbps	Low when linked at 10 Mbps, blink for activity
3	CN9 Link at 100 Mbps	Low when linked at 100 Mbps, blink for activity
5	CN9 Link at 1000 Mbps	Low when linked at 1000 Mbps, blink for activity
7	CN11 Link at 10 Mbps	Low when linked at 10 Mbps, blink for activity
9	CN11 Link at 100 Mbps	Low when linked at 100 Mbps, blink for activity
11	CN11 Link at 1000 Mbps	Low when linked at 1000 Mbps, blink for activity
2, 4, 6, 8, 10, 12	3.3 volts or ground Depends on JP2 setting	If JP2 1-2 is shorted these pins will be ground If JP2 2-3 is shorted these pins will be 3.3 volts

Table 8: CN15 External LED Drive

3.3.6 Bus Connectors

CN1(Top) & CN2(Bottom): PCIe Connector

The PCIe connector is the connection to the system CPU. The position and pin assignments are compliant with the *PCI/104-Express Specification*. (See PC/104 Specifications on page 24)

The LAN25255HR and LAN35255HR are "Universal" boards, and can connect to either a Type 1 or Type 2 PCIe/104 connector.

CN3: PCI Connector

The PCI connector is the connection to PCI peripheral modules. This connector is used only as a pass through connector on this board.

3.4 Steps for Installing

1. Always work at an ESD protected workstation, and wear a grounded wrist-strap.
2. Turn off power to the PC/104 system or stack.
3. Select and install stand-offs to properly position the module on the stack.
4. Remove the module from its anti-static bag.
5. Check that pins of the bus connector are properly positioned.
6. Check the stacking order; make sure all of the busses used by the peripheral cards are connected to the cpuModule.
7. Hold the module by its edges and orient it so the bus connector pins line up with the matching connector on the stack.
8. Gently and evenly press the module onto the PC/104 stack.
9. If any boards are to be stacked above this module, install them.
10. Attach any necessary cables to the PC/104 stack.
11. Re-connect the power cord and apply power to the stack.
12. Boot the system and verify that all of the hardware is working properly.

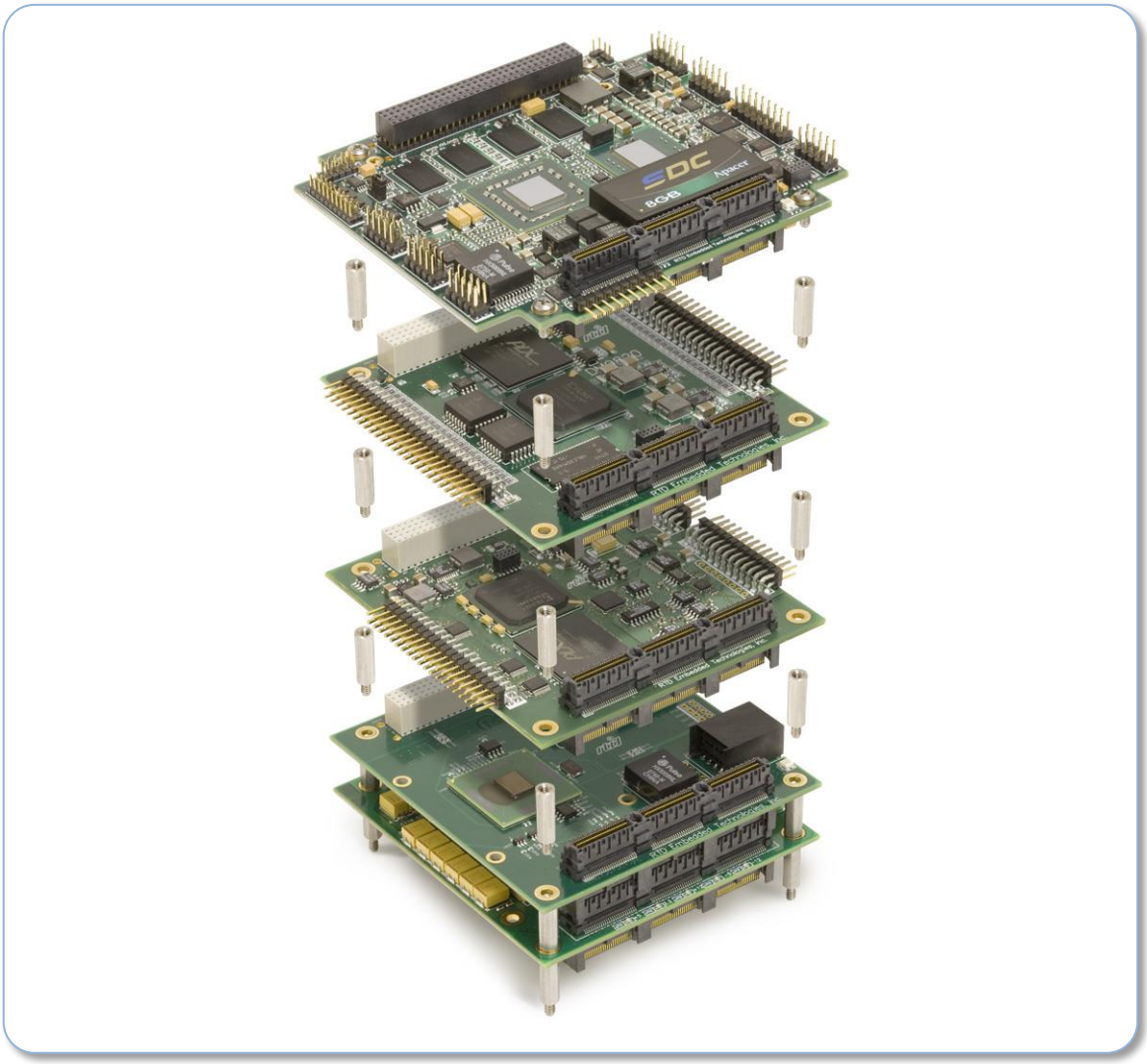


Figure 4: Example 104™ Stack

4 Functional Description

4.1 Block Diagrams

The Figures below shows the functional block diagram of the LAN25255HR, IDAN-LAN25256HR, and IDAN-LAN25256-SFP. The various parts of the block diagram are discussed in the following sections.

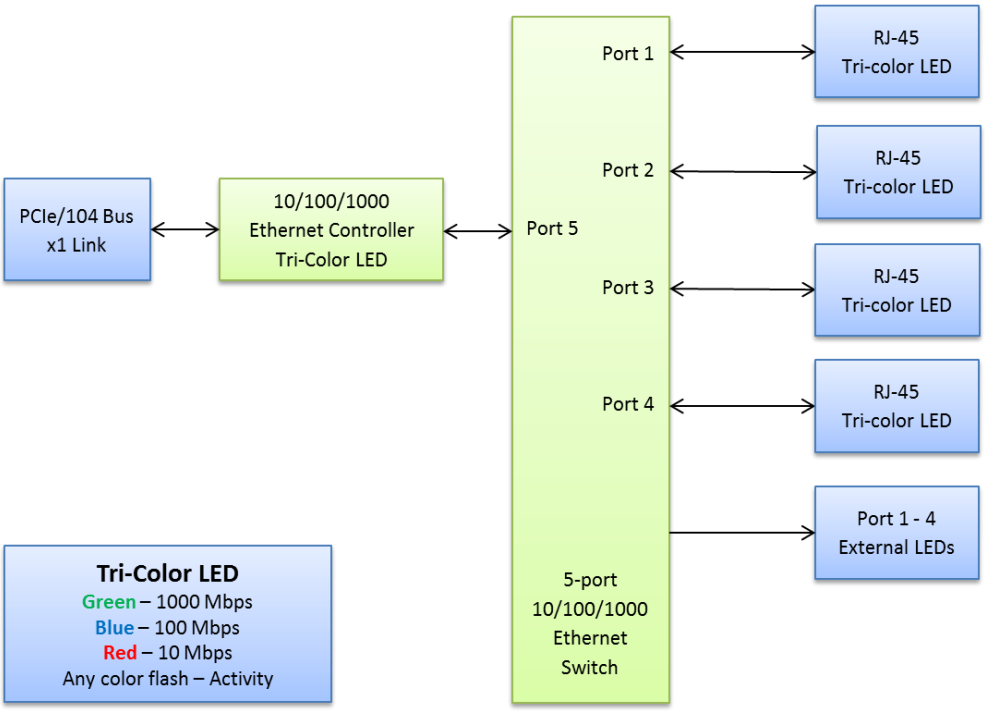


Figure 5: LAN25255HR/LAN35255HR and IDAN-LAN25255HR/LAN35255HR Block Diagram

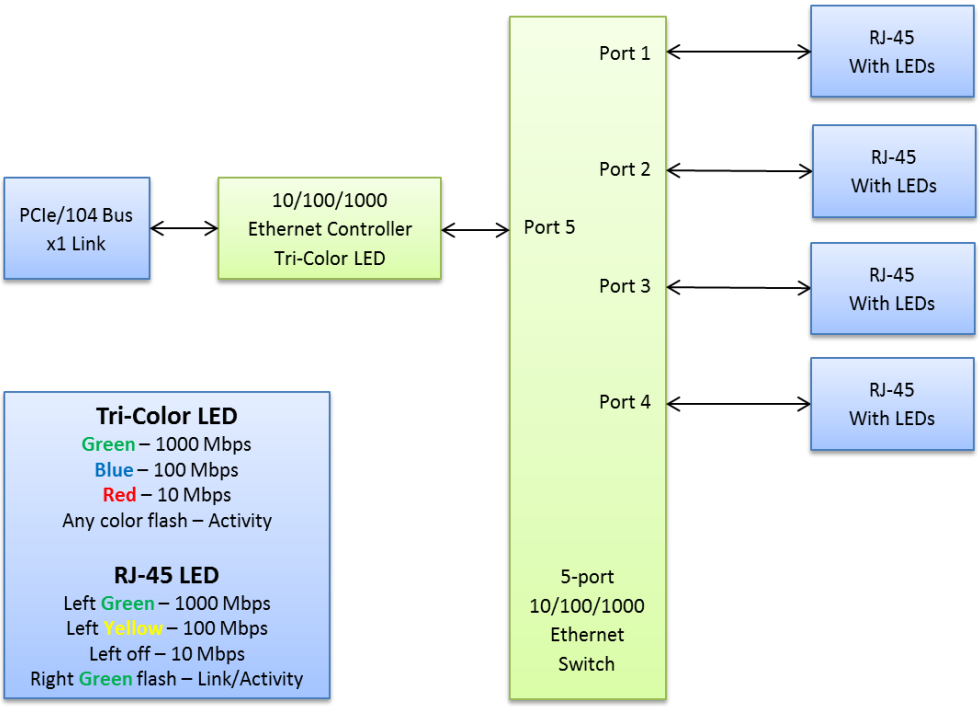


Figure 6: IDAN-LAN25256HR/ IDAN-LAN35256HR Block Diagram

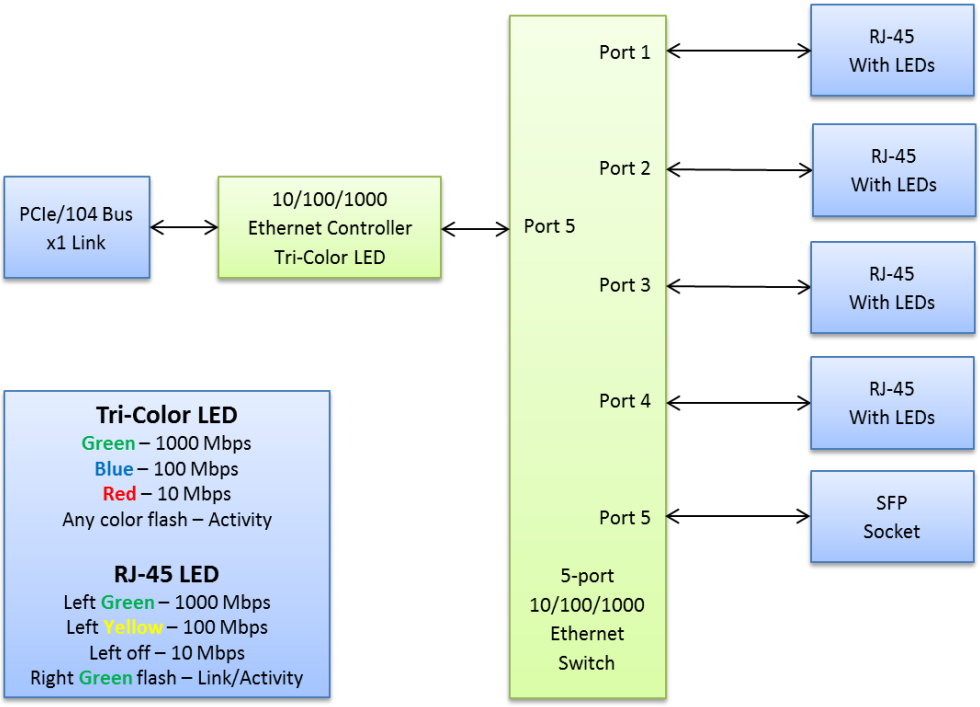


Figure 7: IDAN-LAN25256HR-SFP/LAN25256HR-SFP Block Diagram

4.2 BroadCom Gig-Ethernet Switch

The main component of the LAN25255HR is the BroadCom BCM53115 Gigabit Ethernet switch. This is an industrial temperature rated, 5 port Gigabit Ethernet switch. This switch contains 5 full-duplex 10/100/1000 BASE-TX Ethernet transceivers for network interfacing. One of these ports is used in conjunction with the WG82574IT for a host port. This allows the LAN25255HR to work as its own mini-server in a stacked system. In a stand-alone system the BroadCom switch acts as a basic Ethernet switch. Any port can be used as an upstream port to supply a connection to the 3 other ports.

4.3 Jumbo Frame Support

The Broadcom Ethernet switch is capable of forwarding Ethernet frames up to 9720 bytes. The maximum frame size supported by the Intel Ethernet controller is 9014 bytes. To use Jumbo frames, it must be enabled in the Ethernet Controller driver settings (e.g. via the Device Manager in Windows). Until this is enabled, the Intel controller will drop any Jumbo frames it receives. Note that to use Jumbo frames effectively, all devices connected to the network must have Jumbo frames enabled, AND must agree on the frame size (mismatched frame sizes will result in dropped packets).

4.4 Intel WG82574IT Gigabit Ethernet Controller

The LAN25255HR has an onboard Gigabit Ethernet controller, the Intel WG82574IT. The Intel WG82574IT is an industrial rated Gigabit Ethernet controller which features Auto-Crossover for MDI/MDI-X, 9014 byte Jumbo Frame support, 40KB packet buffer size and IPv4/6 support. This controller connects to the host CPU through a x1 PCI Express link on the PCIe/104 connector and interfaces through the fifth port of the Ethernet switch to provide a host port for stacked systems.

4.5 Onboard LEDs and External LED Connectors

The LAN25255 has onboard LEDs for each of the five Ethernet ports on the board. The setting for the onboard LEDs is to show link activity, status and speed at 10/100/1000M. To bring the LEDs out of an enclosed system, there are two 0.1 inch DIL connectors (CN14 & CN15) that can be wired to external LED circuitry. These signals are can source or sink 24 mA and the connector has jumper options for 3.3 volt or ground to facilitate external LED configuration.

5 IDAN Connections

5.1 Module Handling Precautions

To prevent damage due to Electrostatic Discharge (ESD), keep your module in its antistatic bag until you are ready to install it into your system. When removing it from the bag, hold the module by the aluminum enclosure, and do not touch the components or connectors. Handle the module in an antistatic environment, and use a grounded workbench for testing and handling of your hardware.

5.2 Physical Characteristics

- Weight: Approximately 0.21 Kg (0.46 lbs.)
- Dimensions: 151.972 mm L x 129.978 mm W x 16.993 mm H (5.983 in L x 5.117 in W x 0.669 in H)

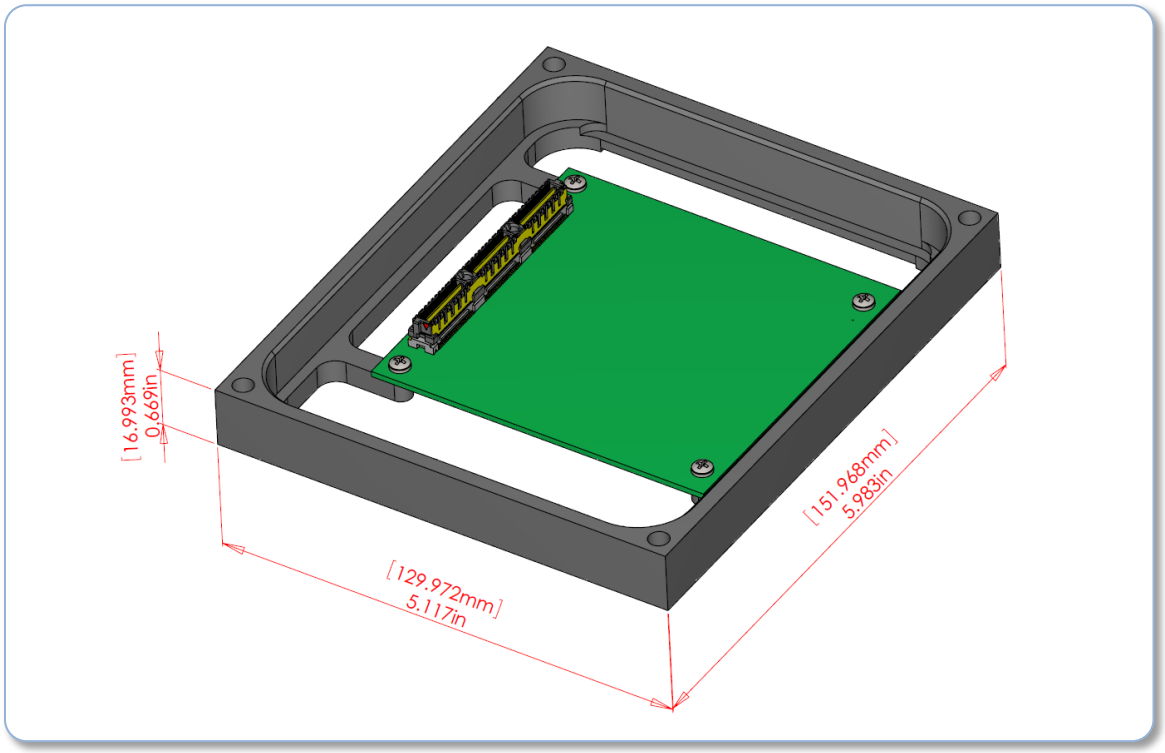


Figure 8: IDAN Dimensions

5.3 IDAN Versions

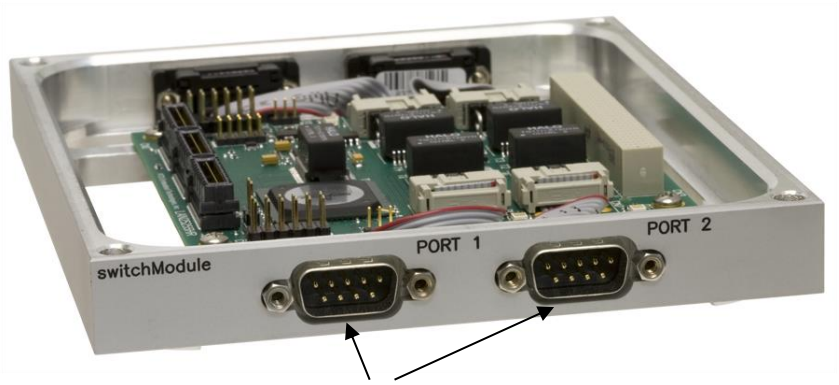
The Ethernet switch module is available in two IDAN versions. The IDAN-LAN25255HR and IDAN-LAN35255HR feature rugged 9-pin "D" connectors and the IDAN-LAN25256HR and IDAN-LAN35256HR feature standard RJ45 connectors.

5.3.1 IDAN-LAN25255HR AND IDAN-LAN35255HR

This utilityModule is an IDAN configuration with 9-pin "D" connectors. The module comes with four 9-pin "D" to RJ45 adapters as shown below.

Figure 9: IDAN-LAN25255HR and IDAN-LAN35255HR

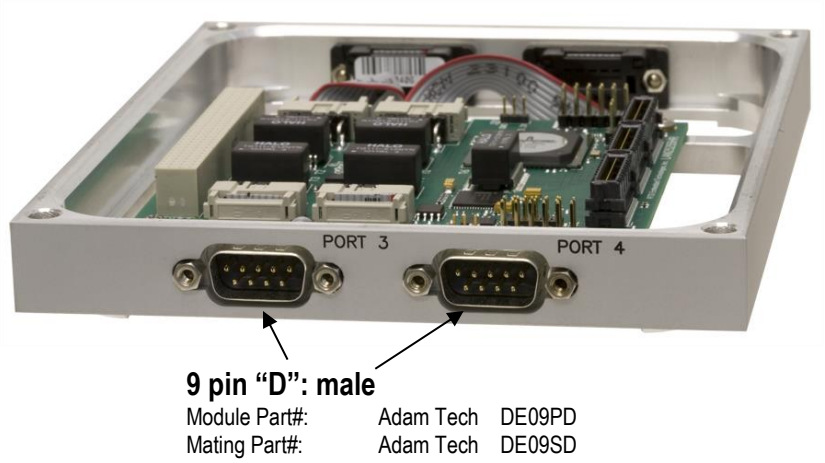
Figure 10: IDAN-LAN25255HR and IDAN-LAN25255HR Front View



9 pin "D": male

Module Part#:	Adam Tech	DE09PD
Mating Part#:	Adam Tech	DE09SD

Figure 11: IDAN-LAN25255HR and IDAN-LAN25255HR Rear View



The Ethernet signals on the IDAN-LAN25255HR and IDAN-LAN35255HR are available on a male, DB-9 connector. A DB-9 to RJ-45 adapter is also included for each port.

DB-9 Pin	1000 Function	10/100 Function	RJ-45 Pin
1	MDI_B+	Receive +	3
2	MDI_C+	Not Used	4
3	MDI_A+	Transmit +	1
4	MDI_D+	Not Used	7
5	Shield Ground		N/C
6	MDI_B-	Receive -	6
7	MDI_C-	Not Used	5
8	MDI_A-	Transmit -	2
9	MDI_D-	Not Used	8

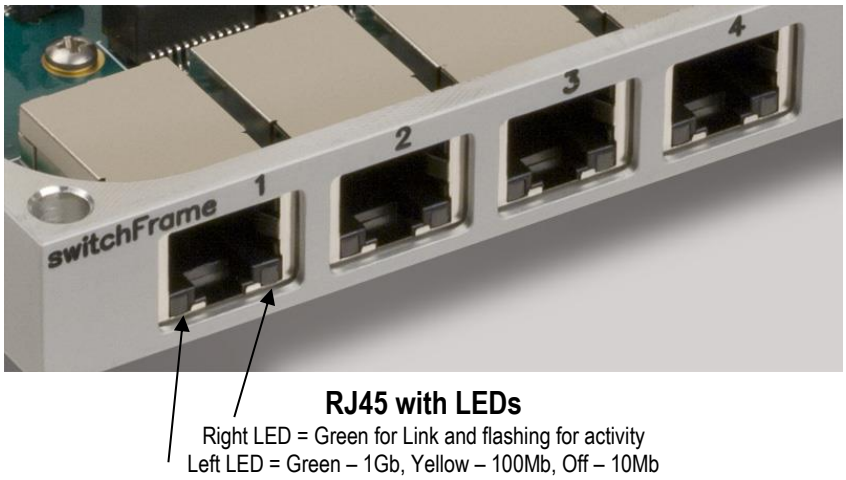
Table 9: LAN25255HR and LAN35255HR IDAN Pin Out

5.3.2 IDAN-LAN25256HR AND IDAN-LAN35256HR

This utilityModule is available in an IDAN configuration with 9-pin "D" connectors. The module comes with four 9-pin "D" to RJ45 adapters as shown below.

Figure 12: IDAN-LAN25256HR and IDAN-LAN35256HR

Figure 13: IDAN-LAN25256HR and IDAN-LAN35256HR Connector Details



The Ethernet signals are available on RJ-45 connectors.

1000 Function	10/100 Function	RJ-45 Pin
MDI_B+	Receive +	3
MDI_C+	Not Used	4
MDI_A+	Transmit +	1
MDI_D+	Not Used	7
Shield Ground		N/C
MDI_B-	Receive -	6
MDI_C-	Not Used	5
MDI_A-	Transmit -	2
MDI_D-	Not Used	8

Table 10: LAN25256HR and LAN35256HR IDAN Pin Out

5.4 Steps for Installing

1. Always work at an ESD protected workstation, and wear a grounded wrist-strap.
2. Turn off power to the IDAN system.
3. Remove the module from its anti-static bag.
4. Check that pins of the bus connector are properly positioned.
5. Check the stacking order; make sure all of the busses used by the peripheral cards are connected to the cpuModule.
6. Hold the module by its edges and orient it so the bus connector pins line up with the matching connector on the stack.
7. Gently and evenly press the module onto the IDAN system.
8. If any boards are to be stacked above this module, install them.
9. Finish assembling the IDAN stack by installing screws of an appropriate length.
10. Attach any necessary cables to the IDAN system.
11. Re-connect the power cord and apply power to the stack.
12. Boot the system and verify that all of the hardware is working properly.

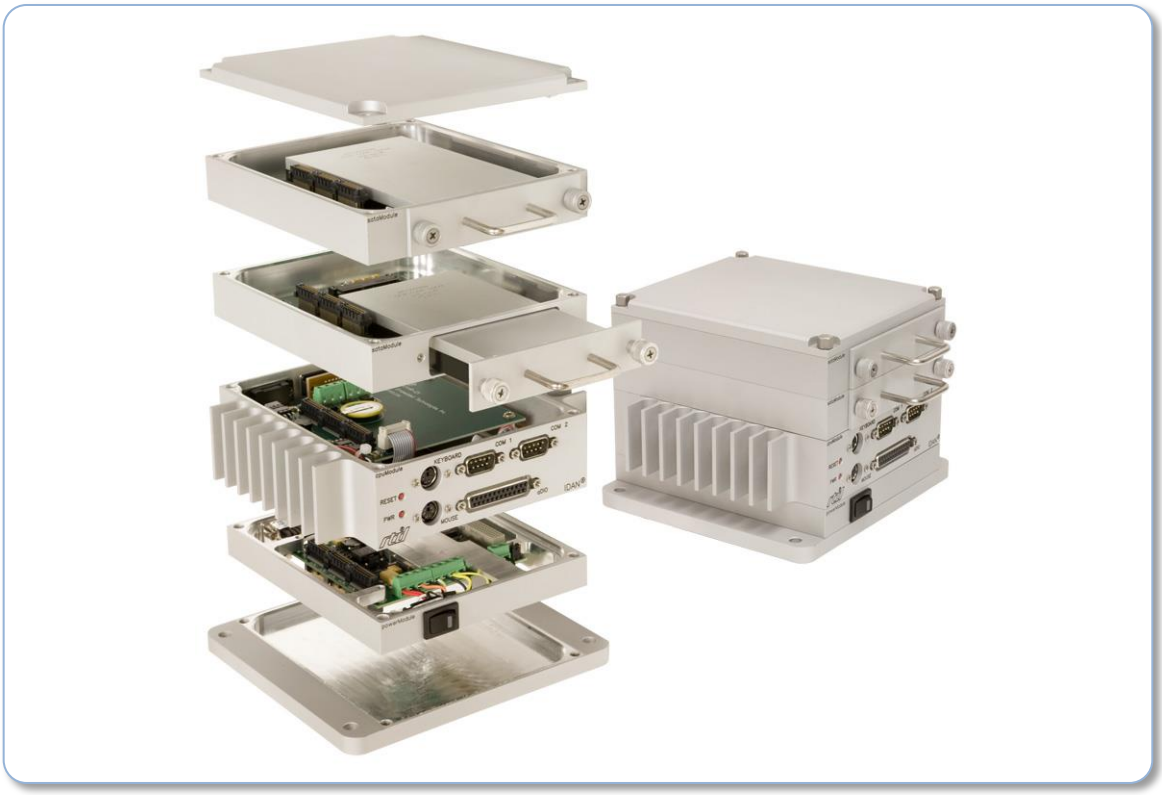


Figure 14: Example IDAN System

6 Troubleshooting

If you are having problems with your system, please try the following initial steps:

- **Simplify the System** – Remove modules one at a time from your system to see if there is a specific module that is causing a problem. Perform you troubleshooting with the least number of modules in the system possible.

- **Swap Components** – Try replacing parts in the system one at a time with similar parts to determine if a part is faulty or if a type of part is configured incorrectly.

If problems persist, or you have questions about configuring this product, contact RTD Embedded Technologies via the following methods:

Phone: +1-814-234-8087
E-Mail: techsupport@rtd.com

Be sure to check the RTD web site (http://www.rtd.com) frequently for product updates, including newer versions of the board manual and application software.

7 Additional Information

7.1 PC/104 Specifications

A copy of the latest PC/104 specifications can be found on the webpage for the PC/104 Embedded Consortium:

www.pc104.org

7.2 PCI and PCI Express Specification

A copy of the latest PCI and PCI Express specifications can be found on the webpage for the PCI Special Interest Group:

www.pcisig.com

8 Limited Warranty

RTD Embedded Technologies, Inc. warrants the hardware and software products it manufactures and produces to be free from defects in materials and workmanship for one year following the date of shipment from RTD Embedded Technologies, Inc. This warranty is limited to the original purchaser of product and is not transferable.

During the one year warranty period, RTD Embedded Technologies will repair or replace, at its option, any defective products or parts at no additional charge, provided that the product is returned, shipping prepaid, to RTD Embedded Technologies. All replaced parts and products become the property of RTD Embedded Technologies. Before returning any product for repair, customers are required to contact the factory for a Return Material Authorization (RMA) number.

This limited warranty does not extend to any products which have been damaged as a result of accident, misuse, abuse (such as: use of incorrect input voltages, improper or insufficient ventilation, failure to follow the operating instructions that are provided by RTD Embedded Technologies, “acts of God” or other contingencies beyond the control of RTD Embedded Technologies), or as a result of service or modification by anyone other than RTD Embedded Technologies. Except as expressly set forth above, no other warranties are expressed or implied, including, but not limited to, any implied warranties of merchantability and fitness for a particular purpose, and RTD Embedded Technologies expressly disclaims all warranties not stated herein. All implied warranties, including implied warranties for merchantability and fitness for a particular purpose, are limited to the duration of this warranty. In the event the product is not free from defects as warranted above, the purchaser's sole remedy shall be repair or replacement as provided above. Under no circumstances will RTD Embedded Technologies be liable to the purchaser or any user for any damages, including any incidental or consequential damages, expenses, lost profits, lost savings, or other damages arising out of the use or inability to use the product.

Some states do not allow the exclusion or limitation of incidental or consequential damages for consumer products, and some states do not allow limitations on how long an implied warranty lasts, so the above limitations or exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

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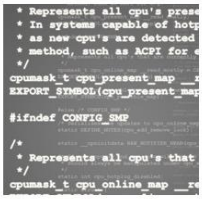

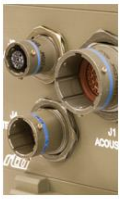
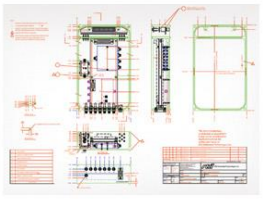

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